

## **Proposal for the 2007 AAAI Spring Symposium Series**

**Title** Robots and Robot Venues: Resources for AI Education

### **Organizing Committee**

Doug Blank, dblank@brynmawr.edu, Bryn Mawr College  
Holly Yanco, holly@cs.uml.edu, U Massachusetts, Lowell  
Zach Dodds, dodds@cs.hmc.edu, Harvey Mudd College, (contact)  
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Paul Rybski, prybski@cs.cmu.edu, Carnegie Mellon U

### **Motivation**

The use of autonomous robots in the undergraduate curriculum has grown remarkably over the past decade. A particularly promising development has been a surge in the number and popularity of robot-themed exhibitions and competitions. These venues spark interest in AI, motivate class/research projects, and invite students into communities that extend beyond the walls of their particular institution. Yet obstacles to participation can be substantial: they include robots' costs in time and money, curricular constraints, and the competitiveness underlying some robotic venues. Our symposium will explore this "educational space," with an eye toward optimizing robots' and robot venues' effectiveness under these and other very real constraints.

### **Symposium Goals**

Thus this symposium will bring together hardware, software, and curriculum designers for autonomous educational robotics, interested educators, and robot contest/exhibition organizers. The group will investigate and articulate how educators, especially undergraduate educators, can leverage autonomous robots and robot-themed venues as educational experiences for their students.

The symposium will seek to frame and answer several nuts-and-bolts questions:

- What makes robot competitions and exhibitions inviting, worthwhile, and feasible for newcomers and what features will keep teams and schools returning?
- How can educators maximize the motivation and impact of robots and robot venues for their students while minimizing time-and-money costs?
- How might emerging hardware and software resources lower the barriers to robot use and robot-themed community building?
- What curricular strategies enable student participation at robot venues and support robotic research projects, but still remain administratively workable?

## **Tentative Schedule**

The four broad goals above motivate the following tentative sessions. Each session will combine short, prepared presentations with the opportunity for the entire group to reflect, comment, and interact.

### **Platforms, software, and curriculum - what's on the horizon?**

2006 has seen and will see several remarkable shifts in robotics resources available to educators. Even as AI Magazine's current issue archives several educational uses of the current generation of low-cost robots, the next generation is emerging:

- Sony has discontinued the popular, powerful AIBO robotic dog.
- iRobot published and programmatically opened the serial interface to the 1.5 million roomba vacuums already in households
- Lego announced the fall release of its Mindstorms kit, the NXT
- Similarly, the Handy Board 2 controller will succeed its longstanding predecessor this fall.
- Bluetooth support has already come out for the roomba and Handy Board; it is slated for the NXT and Handy Board 2, as well.
- Large companies such as Microsoft are getting involved in robotics-based CS education

In addition or conjunction with these events, many university-based hardware and software development projects are coming to fruition.

With these changes so recent (or pending), it might seem too early to address them. Among those that have expressed interest in this symposium, however, are early adopters (or the designers) of each of these and several other projects. Thus, this session will be able to share early reports of emerging platforms' capabilities, software resources, and their curricular impact.

We will encourage participants to bring hardware and software to demonstrate and share - this hands-on interaction will be the break-out portion of this session. The whole group will conclude with a consideration of the possibilities and limitations that these resources bring to the educational community and to the goal of community-building.

### **Venues and Experiences - what works?**

This session would present the rationale, organization, and experiences with a number of different robot-themed venues. These include a wide variety of community-building exhibitions and competitions, both regional and national in scale.

This introduction is particularly timely, given the newcomers, e.g., Robocup @ Home, the Mini Grand Challenge, Beyond Botball, the Indoor Aerial Robot Competition, and the Mobile Robot Software Competition, that have joined the longer-running events, such

as AAAI's Robot Competition and Exhibition. To maintain focus, we will be sensitive to the issue of computational vs. constructive emphasis. In some robot venues, e.g., the Trinity Fire-Fighting contest and Micromouse, the engineering effort can outweigh the computational components. Even so, this is a continuum of emphasis, not a binary property.

After the presentation, small break-out groups will consider the obstacles and motivations to participate. Of particular concern will be how robot venues might better serve the goals, requirements, and interests of undergraduate participants, complementing the often explicit considerations of how student teams might best prepare for those venues. As counterpoint or complement, groups may consider the "big vision" approach that has motivated research for successful venues like Robocup and the DARPA Grand Challenge. The symposium will reconvene with a panel of the presenters to discuss and address the ideas that arise.

### **"Minimax" search - minimizing costs, maximizing impact**

This session shifts attention from external robot-themed events to educators' strategies and constraints for leveraging them. Participants will anchor the session with presentations of their successful (or unsuccessful) strategies for community-building with robotic projects. Again, small break-out groups will consider institutional and curricular constraints. A full-group response to these concerns will follow.

This session will specifically consider how robots can and have acted as a bridge from the undergraduate computer science curriculum into AI and related research fields. Robots can motivate both undergraduate and graduate research projects, even when the theme of those projects is not robotics per se. Such projects offer an alternative - or perhaps additional - motivation for incorporating autonomous robots into the undergraduate curriculum.

Further, this session will include presentations and a panel on curricular innovations and organizations that help maximize students' engagement with AI-based communities outside their own schools. Ideas regarding creative course syllabi, assignments, scheduling, funding, and administration will form a basis for whole-group discussion that will inform both educators who might leverage robots and designers of robot-themed venues alike.

### **The no-overhead robot venue: a hands-on experiment.**

This concluding session will help ground the ideas that grow from the previous three. It will be a brief robot challenge involving the symposium participants; it will be "no-overhead" in the sense that no presymposium preparation by the participants will be needed.

- Introduction, teams and software set up: 1/2 hour
- Teams work toward an exhibit: 1 1/2 hours
- Demonstrations: 1/2 hour (3 minutes x 10 teams)

We will conclude this robot venue by considering as a group the question of balance: along the spectrum from one-shot, "no-overhead" exercises and preparation-intensive competitions, where are the sweet spots that educators, venue organizers, and resource designers should aim for?

This discussion will dovetail into the conclusion for the symposium as a whole, centering on

- What overhead does robot-based curriculum and community-building really require?
- What concrete "next steps" can be taken by
  - interested educators
  - contest organizers
  - hardware designers and vendors
  - software and curriculum writers

### **Interest expressed**

This symposium would continue an every-three-year tradition of considering educational robotics. However, in its explicit focus on community-building through robot venues such as competitions and exhibitions, we believe that interest will be even broader than in 2001 and 2004.

The list below, people who have already expressed interest, constitutes only a starting point for this symposium. Submissions for the '01 and '04 symposia met or exceeded AAAI's participant goals. Because of the expanded focus of this event and because of increased interest in the effective use of robotic resources in education, we feel confident that this symposium will bring a full and dynamic group to Stanford in the spring of 2007.

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